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CLASSIFICATION AND DEVELOPMENT OF PRIMITIVE IMPLEMENTS

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The various ancient remains of man throughout the world have been so divided and subdivided by archeologists as to present great difficulties when we attempt to study them chronologically. The whole theory of the distinction between the Paleolithic and the Neolithic periods, as the words themselves signify, is the ancient from the recent in the stone period. Is there sufficient evidence to sustain any such mechanical difference among the races of the world? By the majority it is contended there is an abundance of such evidence; the writer contends the contrary.

The only rational hypothesis on which a Paleolithic period may be sustained is that paleolithic implements are complete implements in themselves. If, on the contrary, they are not finished articles, the argument in favor of such a period utterly fails. Whether they are or are not implements has given rise to great diversity of opinion, and the discussion for and against has at times been quite heated.

This question has been discussed but little from a technological point of view, which is remarkable when we consider that the matter relates to the uses to which implements have been put by primitive man and to the means by which they were made. There are few persons who have attempted to work with primitive tools and there are probably even fewer who have tried to produce them by primitive methods. The writer has demonstrated how some of the neolithic or polished implements were

made, and has experimented sufficiently in chipping different stones to be able to say in what manner much of this chipping was done, and to demonstrate that unusual expertness and skill were requisite in order to shape many of the so-called paleoliths. With the average neolith little time was required to complete it and but little skill was needed, for the tools with which the work was done were most primitive. With the paleolith, on the other hand, but little time would be required to complete it, but the tools necessary were complex and much skill was required not only intelligently to chip the stone, but yet more so to select a proper stone for chipping.

Imperfect knowledge of the lines of fracture of stones has led archeologists to describe as implements certain objects which, were they found in America, would be considered as unfinished implements or raw material. The so-called "cache tool" or lanceolate stones, commonly found in great numbers in a single place, was probably stock material carried from the original source of supply in that shape in which it could best be transported for subsequent specialization into implements. It is not meant to deny that implements or objects of this character would never be employed as tools for any suitable work, but it is suggested that they were not as suitable as were other implements for any work for which they could be employed. In the effort to produce the cache-tool type many failures resulted, as is evidenced in the great quarries at Washington city and at Flint ridge, Missouri, as well as in every other place of original supply in the whole country.

Owing to the differences in shape of these "cache" implements when compared one with another, and to similar differences in many cave implements from the continent of Europe, and the common European drift type of implement, yet the wonderful similarity in general shape and finish among the whole lot, whether from Europe or America, many specialists insist on seeing in them tools which they acknowledge are ruder than implements belonging to modern stone-age peoples, and argue that the rudeness of these objects is in itself evidence of an inferior mechanical skill in those who made them when compared with peoples of a later period. These views the writer has combatted and contends that the differences of shape in these implements are due primarily to structural differences in the fracture of mate-

rial rather than to the mechanical ability of the one who did the fracturing. The angle of cleavage of a stone when artificially chipped or flaked varies considerably and must not be confounded with its cleavage, taken in the ordinary mineralogical sense. Flint, rhyolite, jasper, obsidian, and quartzite vary greatly in their fracture in the same ledge a few feet apart.

Much of the present theory of the existence of paleolithic man as now understood appears to depend on the proper solution of these views. If the "paleolith," as a tool, does not represent a specific mechanical status, then it represents nothing. The shape of this style of implement remained unchanged through eons of time, we are told, because man continued to imitate a most primitive shape of tool. Let us look into primitive conditions and see if we may substantiate this view or if we must abandon it as untenable.

Naturally man's condition will be influenced largely by his surroundings; climatic changes, differences of food-supply, the character of his neighbors, whether man or beast, and the supply of raw material to fill his wants—all would have their influence. Such differences, however, will be found not to have caused any variation in the simpler implements which, wherever found on the earth's surface, include knives with which to cut, hammers to bruise or break, abraders to smooth rough surfaces, clubs for defense, thongs with which to tie, piercers with which to make holes, pigments for coloring, vessels to hold things, and covering used as clothes or for ornament. The very marked similarity in all these objects on the different continents is reasonably conclusive that they were made and employed for similar purposes and because there was an insufficient natural supply to satisfy the demand.

All research indicates indisputably that the most primitive peoples of whom we have any knowledge not only made use of the bountiful supplies of nature, but that they improved these natural supplies by shaping objects to suit their taste. From the very nature of things, primitive races could not have had any great variety of implements, for, having no knowledge of agriculture, they were restricted to the food supplies spontaneously furnished in the particular locality where they wandered. Fruits, nuts, mammals, birds, fishes—in fact, everything on which man feeds—with the seasons. In localities where supplies

were constant, increase of population would necessitate migration, and where there were seasonal changes man would of necessity be a wanderer. As the fruits ripened in one place or in the other, as game came and went, as the products of the water were scarce or bountiful, as the water was warm or frozen, man would of necessity move from place to place.

A classification of implements demonstrates the wonderful alterations which have taken place in the mechanical skill of the human race since its most primitive stage. Implements have varied enormously, yet the most careful scrutiny suggests that the improvements do not follow those lines which many have hitherto supposed. Archeologists have thought to see in the different implements a gradual upward tendency from an extremely rude beginning, thus showing evolution in the tool itself, apparently ignoring the fact that tools have varied but slightly from their natural shape. As bronze and iron were respectively discovered, however, alterations would naturally suggest differences to those employing these metals.

The many names given to the supposed different periods of man's occupancy of the earth have been of a uniform growth, keeping pace approximately with new discoveries of man's dwellings, a few only of the more striking of which will be referred to.

Wilson in his *Prehistoric Annals of Scotland* first employed the word prehistoric. Goguet first offered evidence of a Copper age in 1758. It was Thomsen, the founder of the great Museum of Copenhagen, who divided the ages of man into those of stone, bronze, and iron, thus providing a basis of scientific chronology. After Boucher de Perthes made his now famous discoveries in the valley of the Somme of the bones of an extinct fauna associated with the implements of early man and lying side by side in what has been claimed to be undisturbed gravel, Sir John Lubbock suggested the term "neolithic" to distinguish the supposed polished stone from the "paleolithic" or chipped-stone period made known by the discoveries of M. de Perthes. Implements claimed by many to be similar to the flints of the European drift have been found in certain American localities, which are asserted by some of the best known American geologists to belong to the talus of certain streams rather than to undisturbed gravel. Lartet divides the prehistoric periods according to the frequency

of finding the bones of the fauna of the later Quaternary mammalia. The correctness of his chronological order of disappearance of animals has, however, been combatted by certain English geologists. Cartailhac divides the life history of primitive man into upper and lower Tertiary and upper and lower Quaternary and identifies these periods by supposed climatic differences as well as by the disappearance of the fauna, as suggested by Lartet.

Mr J. Allen Brown suggests a new arrangement of primitive periods: I. Eolithic; the rough hewn pebbles of the Chalk plateau. II. Paleolithic; higher drift; oldest breccia. III. Mesolithic; between Paleolithic and Neolithic. IV. Neolithic; polished.

M. Gabriel de Mortillet classifies these periods into the same as Mr J. Allen Brown, omitting the Mesolithic, yet he subdivides the Eolithic into two periods and the Paleolithic into five, leaving the Neolithic alone and making four more recent periods to include the second Lacustrian.

To M. Adrien de Mortillet appears to be due the credit of first making a classification of prehistoric tools according to their purposes—I. Cutting tools; II. Rasping tools; III. Striking and crushing tools; IV. Perforating tools—all of which are subdivided according to whether they work by a blow, by friction, or by pressure, and are further subdivided by specialization, in which the scissors, shears, and drawing-knife are included under number I, the rasp and file under number II, mills under number III, and gimlets and augers under class IV, which are hardly to be included under pure stone-age conditions. I would take exception also to the distinction between pressure and friction, and say that all primitive tools are made primarily by pressure or by blow until man learned to employ fire and heat and cold in tool-making.

This classification appears to have been adopted by Professor W. H. Holmes, but elaborated by subdividing according to the work performed by the respective tools. Professor McGee, in referring to Holmes' classification, suggests that in the shaping arts the fracturing process began with lowest savagery and culminated in highest savagery, declining through barbarism and civilization; that the battering process (class II) began toward middle savagery, culminated in barbarism, and then declined; the incising process (class III) began in savagery, increased slowly

through barbarism, and continued to the present; that the abrading process (class ?) began in middle savagery and feebly increased through the cultural stages. To these views of Messrs Holmes and McGee, Dr Brinton took exception as being a departure from European views. To this Professor McGee said the views were based on American phenomena, which were different from the European.

The writer must dissent from the views of Messrs McGee and Holmes as not being sustained by American phenomena and even less by that of Europe, for with scarcely an exception the arts have improved from the beginning. As to differing with European views, that should not signify in the slightest, one way or the other, and it is submitted that deferring to the views of a class or school can have no other effect than, as has occurred in America, the blind following of Europeans, there being no reason why Europeans should not err as well as Americans in determining primitive tool uses.

In many instances the supposed differences in the art of flint-chipping has been the distinguishing feature of implements, by means of which the periods to which they belonged could be determined. The names of these periods have been so subdivided by European archeologists as to give rise to inextricable confusion in any effort to place them in chronologic order. One of the most distinguished of European scholars has suggested that all be called the Paleolithic, and until this suggestion is adopted the confusion will continue to increase.

That the fracture of stone implements is due entirely to the character of the stone worked may be demonstrated by any one who will, with an ordinary hammer, pass two or three days in fracturing different stones and in trying to fashion them into particular shapes. Only a few years ago European writers invariably spoke of the inferiority of American chipped implements, when compared with similar European specimens, as being evidence of the low stage of mechanical skill of the American Indian in precolumbian times, but when arrowheads from California, Oregon, and New Mexico were shown it was admitted that the western American was an expert in the use of the flaking tool, thus demonstrating that perfection of chipping or flaking depends absolutely on the homogeneity of the material worked.

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<i>Natural material.</i>	<i>Natural function.</i>	<i>Primitive tool.</i>	<i>Special tools.</i>	<i>Complex tools.</i>
Stone..... Wood..... Shell..... Bone.....	To crush.....	{ Hammer. Sledge..... }		
Stone..... Shell..... Bone..... Wood.....	To cut.....	{ Saw..... Knife..... }	{ Scraper..... Chisel..... Gouge..... }	{ Ax. Hatchet. Hand grips, soft. Solid handles. }
Sand..... Stone..... Wood..... Shell..... Skin..... Bone.....	To abrade.....	{ Sand..... Grit..... }	{ Coral..... Skin..... }	{ Stone of varying hardness, used with sand and water. Bone. Fish skin. Gritty woods. }
Pigments.....	To color.....	{ Dye..... Paint..... }	Feathers.	
Wood..... Vines..... Shell..... Bone or horn..... Skin.....	To lift or strike.....	{ Club..... Lever..... }	{ Wedge..... Lance..... }	Ornamental handles.
Wood..... Vines..... Skin.....	To bind.....	{ Thong..... Withe..... }	{ Intestine..... Sinew..... }	{ Grass (platted, bound, or twisted). Pounded vegetal fiber. Strips of hide. Hair. }
Stone..... Shell..... Wood..... Bone or horn..... Skin.....	To contain.....	{ Bowl..... Bag..... }	Raft.....	{ Reeds bound together. Gourds. Bladders. }
Stone..... Wood..... Bone or horn..... Shell.....	To pierce.....	{ Pin..... Awl..... }	Rodkin.....	{ Needle. Drill. Lathe. }
Wood..... Shell..... Stone..... Skin.....	To cover.....	{ Skin..... Ornament..... }		{ Skins dyed and colored. Bark and feathers bound together. Tanning. }

RESULTS OF PRIMITIVE METHODS

Handles held by grooves and holes cut into the stones.

Handles bound on by strings.

Handles grown on implements.

Handles held by dowels.

Handles held by wedges.

Handles by gum and gluing.

Swelling of wedges to crack stones.

Arrow, spear, lance, dagger, and flaker are hafted.

The weight to shaft produces the digging stick.

Strings made into nets.

The house, tent, bedding, basket.

Boats of hollow logs, of bark, of skin.

Pots, pans.

The classification here submitted is believed to cover the most primitive period of man as a tool-maker throughout the age of stone in all countries.

Articles which in their natural state may be employed as tools do not appear to have been properly considered in regard to the influence they would have in governing the shape of primitive implements, nor do the physical actions of nature in adding to the tool-supply appear to have been studied in investigating the development of the implements of prehistoric man. Animals, the stones from water-courses, the minerals formed on the ledges of hills, shell from the seashores, and canes and other vegetal growths, all supplied the most primitive races with implements. Ivory, horn, bone, skin, water-worn pebbles, spalls broken from larger stones by frost or heat (with their sharp points or edges), shells, wood shaped by fire or decay, even the sand beds, coconuts, gourds, and vines furnished natural implements in almost endless variety.

The earliest trace of man acquaints us with him not only as a tool-user, but as a tool-maker, who shaped stones by chipping them, who scraped bone, ivory, and horn into forms to suit his convenience, even to the extent of perforating and carving them in imitation of men and beasts and fishes; he added to the natural supply of his particular neighborhood; he imitated the natural results of stone rubbing against stone in running streams and knew how a blow from a stone would affect other stones by shattering into spalls similar to those which occasionally would be derived from the effects of frost or fire.

Many travelers have referred to the implements employed by primitive races living in the lowest stages of savagery, and almost without exception it is found that the rudest people in mechanical development have made the best uses of the natural productions of their particular locality. Among these are found stones to hurl, hammers with which to strike, deer-horn and fish bone piercers, the spurs of birds and splinters of stone or bone for arrow-heads where bows are used, and thorns and splinters for pins and needles; split canes, shells, and spalls of stone furnished knives; the limbs of trees supplied clubs and levers, and shark teeth and shells were used as saws and razors; sand and coral were the grinding stones, and smooth pebbles were used as polishers; turtle-shells, shellfish, and cocoanuts provided drinking vessels, and even shields; bladders and gourds supplied receptacles, and skins of animals or bundles of reeds furnished the means of crossing deep streams; vines, entrails, and the tendons of animals were used as cords for different purposes; the skins of beasts and of birds answered where needed as clothing; pigments were employed for coloring, and feathers and shells for ornamentation. These were some of the things employed by man of the earliest stone age.

This classification is not supposed to be perfect, but is believed to cover stone-age conditions in material and process and is offered for criticism, which cannot fail to aid the systematic study of the technology of archeology, which should agree as to the development of tools in Europe, in America, or elsewhere. No matter what argument is advanced as to the mechanical development of the people of the earliest periods, it cannot be successfully denied that those who made the familiar tools and carvings of the caves and who cut and ground the bone and ivory ornaments and made the whistles and other objects from bone and antler, and whom it is now acknowledged made and burned pottery (as the so-called paleolithic man of Europe did, though by some this was long denied), they were in mechanical skill or culture development practically the same man as he of the polished-stone period, for he had necessarily to perform similar work. It will not do to claim that American archeologists because of their want of familiarity with European conditions are incompetent to judge of the accuracy of the paleolithic theory. There are few museums not possessing types of the European

paleoliths, to say nothing of the American chipped stones called paleoliths and admitted to represent similar conditions. The eminent ethnologist, Major Powell, has well expressed the fact that "the mind of man is everywhere the same; the differences of its products are evidences of differences of growth or different conditions of environment." The danger to be apprehended from the paleolithic theory is well evidenced by the flints of Cissbury, in England, and Spiennes, in Belgium, and even the cave-finds of Europe have been criticised by an eminent European archeologist, who has asserted that had they come from near the surface in England they would have been considered neolithic.

If man of the Paleolithic period had taken the stone from which Neolithic man struck long thin flakes and broken it, he would of necessity have broken off such flakes, and just as certainly had Neolithic man tried to improve on the obsidian spear-points of the Easter islander—implements than which none are more rude—he would have ignominiously failed. He would further have found that even to imitate the Easter island implement he would have to break all the spalls from one side of the stone or destroy the specimen because of its peculiar fracture. Was Paleolithic man never in a position where he need break the indurated clays or metamorphic rocks? If he was, he surely could chip but very few, if any, of them.

To summarize, it may be said that primitive life has been everywhere similar and that primitive implements are alike, as are the needs of savage people. This is emphasized in the known similarity in implements the world over. Wherever we find traces of man, there we find his tools; we find the natural supply has been employed and that they were produced by blow or pressure from stone, vegetal products, and animal remains.

DR GEORGE A. DORSEY, who has been an instructor at the Peabody Museum during the last five years, has accepted a call to the Field Columbian Museum of Chicago, to take the position of assistant curator in the department of anthropology. He will be in full charge of physical anthropology at that institution. Mr Frank Russell, of the graduate school of Harvard, has been appointed assistant in anthropology to take Dr Dorsey's place as instructor in Anthropology for next year.—*Harvard Crimson*.